5.1 The Language of Mathematics

- _____ is a branch of math that uses symbols.
- It uses symbols like _____ to represent unknown numbers or quantities.
- These symbols are often letters and are called _____.
- Numbers that are multiplied by variables are called _____.
- Interesting fact: Any person who speaks a modern language will be able to read algebra.
- When you study algebra you work with POLYNOMIALS
- Polynomials are made up of _____.
- Polynomials can have one or more terms and some of them have special names.

SPECIAL NAME	Number of Terms	Examples
Monomial		
Binomial		
Trinomial		

DEGREE

The degree of a **term**: the sum of the exponents on the variables

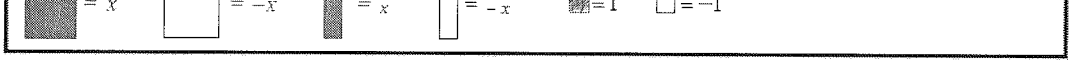
Term	x^2	$3y^4$	x	xy^2	$2ab$	$a^2b^2c^2$
Degree						

The degree of a **polynomial**: The degree of the highest-degree term in a polynomial

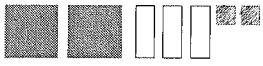
POLYNOMIAL	# OF TERMS	DEGREE	Name
$3x^3 + 7x^2 - 8x$			
$5a^2 + 2a$			
$y - 21$			
x			
$4x + 6xy$			
$x^2 + a^2 + b^2 - c^5y - 8x$			

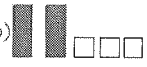
Models using algebra tiles:

Legend:

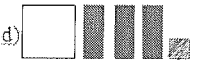


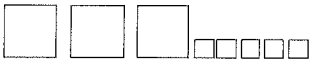
Example 4: What polynomial expression is represented by each set of algebra tiles?

a)  = _____

b)  = _____

c)  = _____

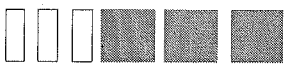
d)  = _____

e)  = _____

f)  = _____

g)  = _____

h) = _____

i)  = _____

j)  = _____

http://my.hrw.com/math06_07/nsmedia/tools/Algebra_Tiles/Algebra_Tiles.html

5.2 Equivalent Expressions

Vocabulary

$5x^2$

Coefficient: A number that multiplies the variable

Variable: A letter that represents an unknown number

Exponent: The number of times you multiply the base in a power by itself

Expression	Coefficient	Variable(s)	Exponent(s)
$4a^2$			
$-4x$			
xy^3			
$-w$			

LIKE TERMS

Terms that have the exact same variable. Indicate the like terms in the list of terms below (underline/circles/squares/stars)

4 $3x$ $-4x$ x^2 $3cb$ 11

$100cb$ -1 $8x^2$ x^2y $0.5x$ $-33x^2y$

$-x^2$ 3.14 $-6cb$ $11x$ $7y$ $2y$

Make up 5 "like terms" for 6t:

COMBINING LIKE TERMS

You can add or subtract the coefficients of LIKE TERMS:

3 apples + 4 apples = 7 apples
8 dollars – 5 dollars = 3 dollars
$3x + 4x = 7x$
$8x^2 - 5x^2 =$
$7y + 2y - 5y =$

UNLIKE TERMS cannot be combined together into one thing

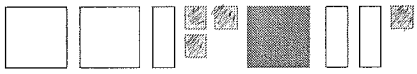
3 apples + 5 dollars = 3 apples + 5 dollars

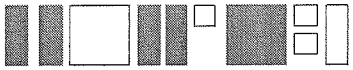
$3x + 5x^2 =$

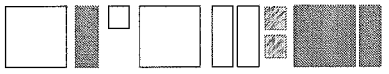
$mn^2 + m^2n =$

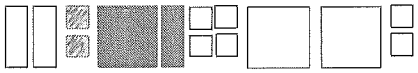
Example 2: Write a polynomial for each of the expressions modeled by the algebra tiles then simplify by removing the zero pairs.

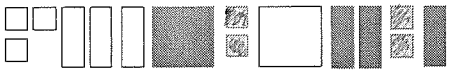
a)  = _____

b)  = _____

c)  = _____

d)  = _____

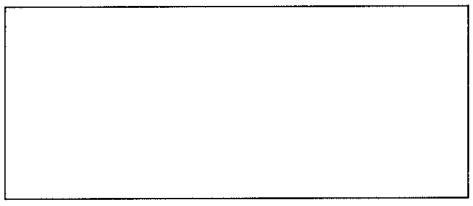
e)  = _____

f)  = _____

Application

Perimeter: the distance around the outside of a two-dimensional shape or figure

Write an expression for the perimeter of the rectangle below and combine like terms



x

$2x - 3$

5.3 Adding and Subtracting Polynomials

Quick review of 5.2

Combine the like terms:

$2a - 1 + 6 - 4a =$

$3t^2 - 5t + t^2 + 2t + 1 =$

***You have just added two polynomials together. Here are the same questions written as the sum of polynomials:

$(2a - 1) + (6 - 4a) =$

$(3t^2 - 5t) + (t^2 + 2t + 1) =$

Now for subtracting (just one extra step...)

OPPOSITES

Two numbers or expressions with the same numerals but different signs

The opposite of 2 *is*
The opposite of $5x$ *is*
The opposite of $3x - 1$ *is*
The opposite of $a^2 - 6a + 7$ *is*

A number and its opposite add to _____

Draw an algebra tile and its opposite. What is the special name we give to these two tiles when they are together?

To subtract a polynomial, just **add** its **opposite**

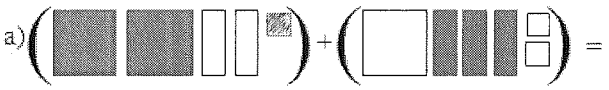
$(3x - 4) - (2x + 5)$

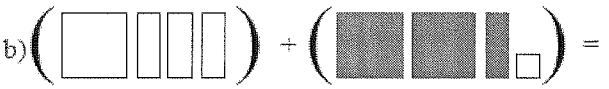
$(4x - 3) - (-x + 7)$

$(5x^2 - 6x + 7) - (x^2 - 2x + 4)$

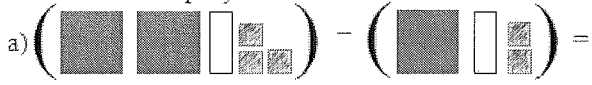
Modeling Addition and Subtraction with algebra tiles

Example 1: Write a polynomial expression for the following algebra tiles then simplify.

a)  = _____

b)  = _____

Example 3: Write a polynomial expression for the following algebra tiles then draw an equivalent model using addition and simplify.

a)  = _____

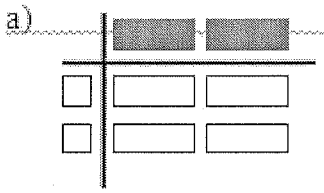
b)  = _____

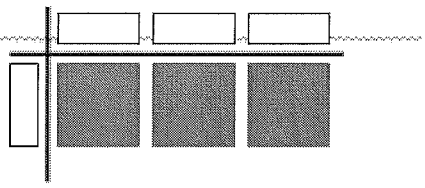
7.1 MULTIPLYING AND DIVIDING MONOMIALS

What is a monomial?
Examples:

Multiplying Monomials

Write an algebraic representation of the models. (Multiplication statement)

a) 

b) 

Now, let's look at it algebraically
$(4x)(3x)$.

*multiply the numerical coefficients first,
then multiply the variables

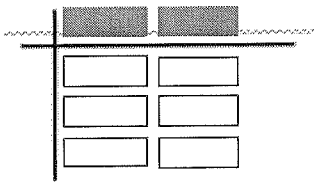
Examples

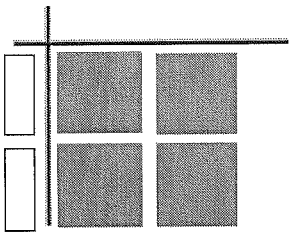
1. $(6x)(2x)$

2. $(-x)(8x)$

3. If the length of a rectangle is $2.1x$ and the width is $4.3x$, what is the area?
$Area\ of\ rectangle\ =\ (length)(width)$

Dividing Monomials





Now let's try this algebraically...

$$\frac{15x^2}{3x} \qquad \frac{-10xy}{-2y}$$

*divide the numerical coefficients first, then divide the variables

$$\frac{36x^2}{4x} \qquad \frac{-18.6mn}{-3m}$$

Application

1. The area of a triangle can be calculated by multiplying the base by the height and then dividing by 2. As a formula it looks like this:

If the area is $20x^2$ and the base is $4x$, then how can we find the height?

7.2 MULTIPLYING POLYNOMIALS BY MONOMIALS

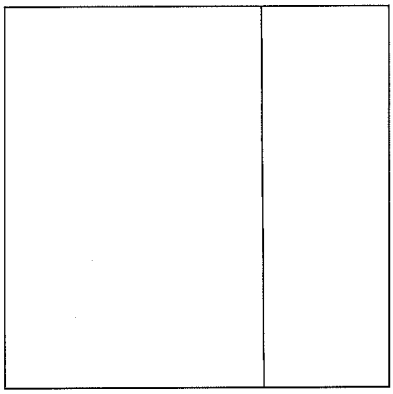
We can think of this in 3 ways:

1. AREA MODEL,
2. ALGEBRA TILES
3. ALGEBRAICALLY

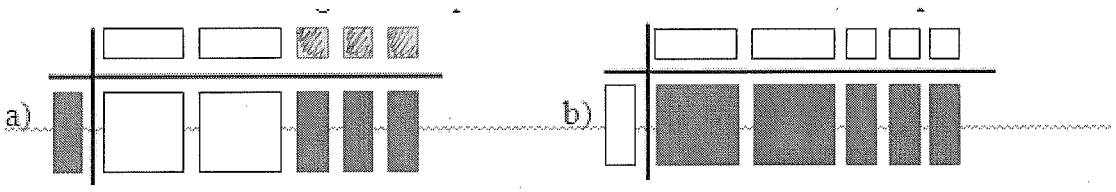
Multiply $(2x)(x + 4)$ using the 3 ways listed above.

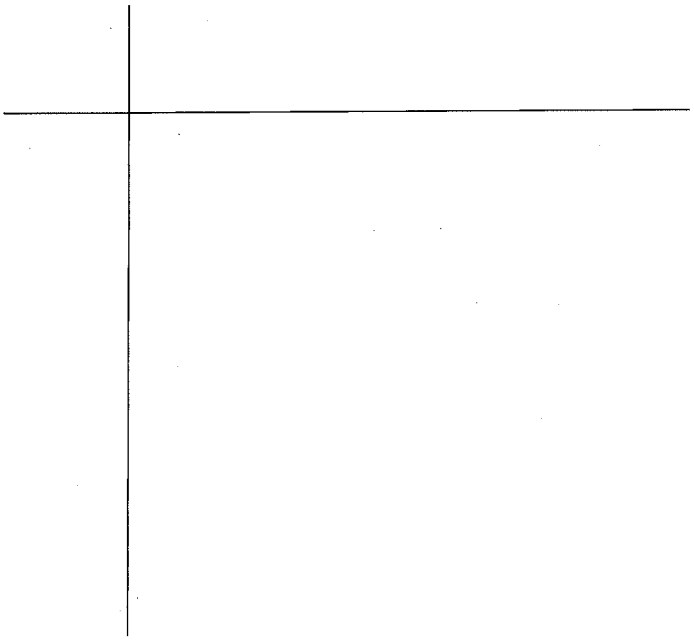
AREA MODEL

$2x$



ALGEBRA TILES





ALGEBRAICALLY

$$2x(x+4)$$

This is called the **DISTRIBUTIVE PROPERTY**

The rule states that a(b + c) = ab + ac for real numbers a,b,c

Use the **distributive property** to expand the following

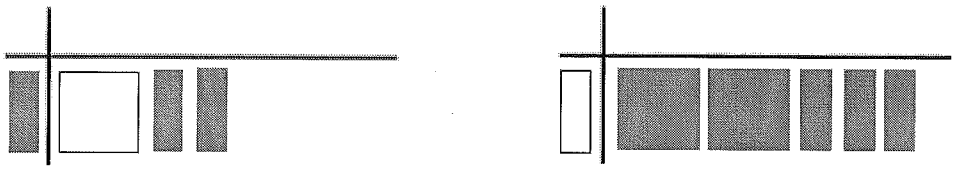
1. $5x(2x - 3)$
2. $(3 - y)(y)$
3. $(-4m)(6m - 1)$
4. $(3x)(x + y)$
5. $(-5a - 4b - 3)(2a)$
6. *Find the area of a blanket that has a length of* $2x$ *and a width of* $2x - 1$

Multiply 32 times 45 using an area model.

7.3 DIVIDING POLYNOMIALS BY MONOMIALS

Example 1: Use algebra tiles to perform the following operations.

a) $\frac{-x^2+2x}{x}$ b) $\frac{2x^2+3x}{-x}$



How can we simplify a quotient algebraically? Write it as 2 separate fractions.

$\frac{16x^2-20x}{4x}$

Find the **errors** in the following simplifications and correct them:

$\frac{10k^2-30k}{10k^2}$

Correct solution

$= \frac{10k^2}{10k^2} - 30k$

$= 1 - 30k$

$\frac{12m^2+12m}{12}$

Correct solution

$= \frac{12m^2}{12} + \frac{12m}{12}$

$= m^2 + 1$

$\frac{8x^2 - 2x}{2x}$

Correct solution

$= 8x^2$

$\frac{8x^2 - 2x}{2x}$

Correct solution

$= \frac{8x^2}{2x} - \frac{2x}{2x}$

$= 4 - 0$

$= 4$

APPLICATION:

A rectangle has an $area$ of $9x^2 - 3x$ and a $width$ of $3x$. What is the $length$?